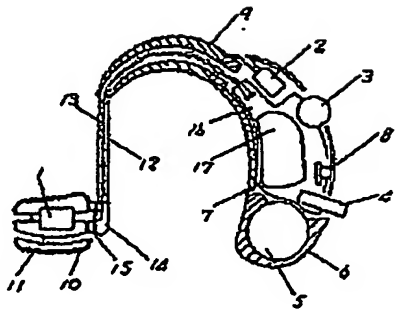
HEARING AID

Patent number:	JP62151100
Publication date:	1987-07-06
Inventor:	NONOMURA HIDEKAZU
Applicant:	MATSUSHITA ELECTRIC IND CO LTD
Classification:	
- international:	*H04R25/02;* H04R25/02; (IPC1-7): H04R25/02
- european:	
Application number:	JP19850295251 19851225
Priority number(s):	JP19850295251 19851225

Abstract of **JP62151100**

PURPOSE:To obtain a flat frequency characteristic compared with the frequency characteristic of a conventional ear hooking type hearing aid by assembling an inner packaging earphone in an ear mold shell formed fitting the ear type of a user.

CONSTITUTION:An inner packaging earphone 1 is assembled in an ear mold 10 formed from the ear type of the user. Also, in the ear mold 10, a vent 11 for ventilation is formed. At the ear mold 10 on which the inner packaging earphone 1 is mounted, a connector 15 facing with a connector 14 at a main body side is provided, and receives an electrical signal from the main body side, and connects it to the inner packaging earphone 1. By placing the earphone within an external auditory meatus, the frequency characteristic can be made flat.



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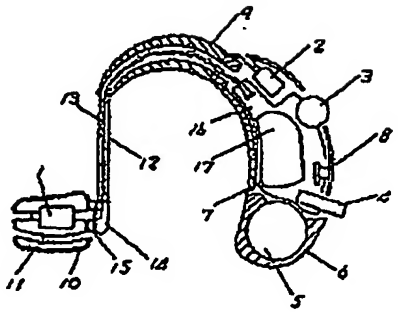

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(54) Title of invention: Hearing aid

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Specification

1. Title of invention

Hearing aid

2. Scope of claims

(1) A hearing aid consisting of a miniature earphone enclosed in a plastic capsule inserted in the user's ear canal, which is connected by a cord to the main unit of the hearing aid of the behind-the-ear type.

(2) A hearing aid according to Claim 1 of this invention with the earmold shell fitting inside the ear canal.

3. Detailed explanation of the invention

Field of applications

This invention relates to hearing aids with the behind-the-ear type main unit.

State of the art

Design of a conventional hearing aid with the main unit of the behind-the-ear type is shown in Fig. 3. Below, we explain the design of such a conventional hearing aid with reference to Fig. 3. In Fig. 3, 21 is an eartip made of silicone attached to an eartip holder 22. Eartip holder 22 is connected to a hanger 24 via sound-transmitting tube 23. Item 25 is a miniature earphone connected to the hanger 24 via the earphone outlet tube 34. Acoustic pressure generated by this earphone 25 is transmitted to the user's ear canal through the following path: earphone outlet tube 34 --> hanger 24 --> sound-transmitting tube 23 --> eartip holder 22 --> eartip 21. Item 26 is a microphone, item 27 is a volume control, item 28 is a switch, item 29 is a battery, item 30 is an adjustment trimmer, item 31 is a battery case, item 32 is an amplifier, item 33 is a plastic case, and item 35 is a printed circuit board. In some cases, because of the shape of the user's ear canal, eartip 21 can not be sufficiently inserted in the canal, which results in howling. Therefore it is also possible to use an earmold shell 36 (shown in Fig. 5) fitting the user's ear canal precisely. In addition, in order to suppress peaks in the frequency characteristic, it is also possible to insert an acoustical filter 37 (shown in Fig. 4) in the hanger 24.

Problems to be solved by this invention

However, since in the above mentioned behind-the-ear type hearing aids, the earphone 25 is located inside the case 33, the sound output has to travel from the earphone outlet to the user's ear canal via the path

consisting of the earphone outlet tube 34 --> hanger 24 --> sound-transmitting tube 23 --> eartip holder 22 --> eartip 21. This results in distortion in the frequency characteristic of the hearing aids which, as it can be seen from Fig. 6, has from 4 to 5 peaks, starting at a frequency of approximately 1 kHz, and respective dips. As a result of these peaks and dips of frequency characteristic, the sound loses its natural tones and becomes less clear. It is possible to suppress peaks and dips of the frequency characteristics of conventional behind-the-ear type hearing aids by using acoustic filter 37 (which is shown by solid line in Fig. 7), thus improving their frequency characteristics to some degree, however it is difficult to smooth peaks and dips over the entire range of the frequency characteristics.

In addition, due to the fact that the earphone is located inside the main unit, it is necessary to prepare a number of behind-the-ear hearing aids for the users trying to select an earphone most suitable to their hearing ability, which seriously limits the selection options.

The purpose of this invention is to eliminate these disadvantages, by taking the miniature microphone 25 out of the main case 33 and to use it instead of the eartip of the conventional hearing aids. This purpose is achieved by enclosing the earphone in an earmold shell 36 made to fit the user's ear canal precisely and by connecting the earphone by a cable to the amplifier located in the main case of the hearing aid. This makes it possible to eliminate peaks and dips in the frequency characteristics caused by the tube and provides more options to the user in the selection of a hearing aid best suited to his hearing abilities.

Methods for solving the problems

In order to achieve the purposes of this invention, the miniature microphone is placed inside the earmold shell precisely fitting the shape of the user's ear, rather than the using of a conventional acoustic conduit in the form of a tube transmitting acoustic pressure from the miniature microphone to the ear canal. In other words, the earphone is placed directly in the external ear canal of the user, thus making it possible to deliver the output acoustic pressure into the external ear canal without distortions. It is also possible to easily select an earphone mounted in the earmold shell which produces the best results from a wider selection of options.

Operation

Due to the above mentioned design, this invention has the following effect. Since the miniature earphone is placed in the ear canal, the frequency characteristic of the acoustic output of the hearing aid is relatively flat having only one to two peaks and dips compared to that of the conventional devices.

In addition, since the earphone is removed from the main unit to the outside, it can be placed at a distance from the microphone located inside the case. This makes it possible to substantially reduce the acoustical and vibrational feedback (producing so-called howling effect), thus providing for a more stable performance than conventional units.

It is also possible to make earmold shells with various types of earphones thus facilitating the task of matching the hearing aid acoustic parameters to specific auditory characteristics of hearing impaired users, thus making it unnecessary to prepare several hearing aids for the testing as it is done in conventional units.

Since the miniature earphone is smaller than the external auditory canal of ordinary people, the earmold shell can be made very small so that it entirely fits inside the ear canal and is practically inconspicuous to an outside observer.

Embodiments

Fig. 1 represents the first embodiment of this invention.

In Fig. 1, item 1 is a miniature earphone mounted inside the earmold 10 molded according to the shape of the user's ear. Earmold 10 has a vent 11 for the passage of air. Item 2 is a microphone, item 3 is a volume control, item 4 is a switch, item 5 is a battery, item 6 is a battery case, item 8 is an adjustment trimmer, item 17 is an electronic circuitry and item 16 is a printed circuit board. All these components are placed inside the main case 7 of the hearing aid. Electric output signals are delivered to the miniature earphone 1 by the cable 13 connected to the power output terminals located on the printed circuit board 16. The cable 13 runs through the tube 12 of the hanger 9 and it is spliced to a connector 14. In the earmold 10 containing the miniature earphone 1, there is a connector 15 which can be joined with the connector 14. Electric signals from the main unit are transmitted to the miniature earphone through these connectors. The advantage of such a design consist in the fact that it is possible to easily prepare a hearing aid having optimal characteristics by preparing an earmold shell consisting of a miniature earphone 1, an earmold 10 and a connector 15 in which earphone 1 can be easily replaced with a number of earphones of different types.

Fig. 2 depicts essential components of another embodiment of this invention. In this embodiment, the miniature earphone 1 is connected directly to the main unit by cable 13, which is fixed to the earmold 10,

without connectors 14, 15. Therefore, in this embodiment it is impossible to change earphones, however, due to the fact that the earphone is placed inside the auditory canal, the frequency characteristics of the hearing aid are rather flat.

Effect of the invention

As it is clear form the explanations given above concerning the embodiments of this invention, by removing the earphone from the main unit of a behind-the-ear type hearing aid and by mounting it in the earmold shell, it is possible to obtain frequency characteristics which are flatter than those of conventional behind-the-ear hearing aids.

In addition, by switching the earmold shell with enclosed miniature earphones of different types, it is possible to adjust the characteristics of the hearing aid to the specific needs of the user.

It is also possible to make the earmold shell sufficiently small so that the hearing aid is only marginally noticeable, thus giving the user psychological comfort and substantially reducing acoustical feedback (howling effect).

4. Simple explanation of the drawings

Fig. 1 represents the design of the hearing aid according to the first embodiment of this invention; Fig. 2 depicts major components of another embodiment of this invention; Fig. 3 shows the design of a conventional hearing aid; Figs. 4 and 5 depict details of a conventional hearing aid; Fig. 6 is frequency characteristic of a conventional hearing aid; Fig. 7 is an improved frequency characteristic of a conventional hearing aid.

1 — miniature earphone

2 — microphone

3 — volume control

4 — switch

5 — battery

6 — battery case

7 — main unit

8 — adjustment trimmer

9 — hanger

10 — earmold

11 — vent

12 — cable sleeve

13 — cable

14 — connector

15 — connector

16 — printed circuit board

17 — electronic circuitry

Agent: Patent Attorney, Toshio Nakao one more person

Fig. 1

1 — miniature earphone
2 — microphone
7 — main case
9 — hanger
10 — earmold
13 — cable

Fig.2, Fig. 3, etc.

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⑫公開特許公報(A) 昭62-151100
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H 04 R 25/02 Z-6824-5D
審査請求 未請求 発明の数 1 (全4頁)

⑭発明の名称 補聴器

⑪特願 昭60-255251
⑫出願 昭60(1985)12月26日

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⑮代理人 弁理士 中尾 敏男 外1名

明細書

1. 発明の名称
補聴器

2. 特許請求の範囲
(1) ~~(省略)~~ 使用者の耳孔内に挿入する耳型本体の中に内蔵イヤホンを組込み、耳介に装着する補聴器本体とはコードによって接続した補聴器。
(2) イヤモールドレシーバを耳孔内におさまるように成形した特許請求範囲第1項記載の補聴器。

3. 発明の詳細な説明
産業上の利用分野
本発明は耳介に空気伝導型を掛けて使用する補聴器に関するものである。
従来の技術
従来、耳介に空気伝導型を掛けて使用する耳かけ形の補聴器の構造を第3図に示す。以下従来例の構成について第3図とともに説明する。第3図において、21はシリコン製のイヤチップでイヤチップホルダー22に取付けてある。またイヤチップホルダー22は導音チューブ23を介して補聴器本体のハンガ24と接続されている。25は内蔵形のイヤホンで、イヤホン音孔チューブ26にてハンガ24に接続され、このイヤホン25で発生した音はイヤホン音孔チューブ26→ハンガ24→導音チューブ23→イヤチップホルダー22→イヤチップ21を経由して使用者の耳孔へ導かれることになる。28はマイクロホン、27は音量調整ボリウム、28は切換スイッチ。29は電池、30は同調用トリマ、31は電池ケース、32は増幅器、33は補聴器の本体ケース、35はプリント基板である。また使用者の耳孔の形状によってはイヤチップ21が十分に挿入できない場合ハウリングを起こすため、使用者の耳型をとって耳孔にピッタリ適合できる第4図に示すようなイヤモールドレシーバ36を用いることもある。その他に周波数特性上でのピークを抑えるために第4図に示すように音響フィルタ37をハンガ24に挿入して用いることもできる。
発明が解決しようとする問題点

ン、3は音響振動ダイヤフラム、4は切換スイッチ、5は電池、6は電池ケース、8は調整用トリマ、17は電子回路部、18はプリント基板であり補聴器の本体ケース7の中に組込まれている。プリント基板18上の出力端子部からケーブル13を通じて電気出力信号が内耳イヤホン1に導かれる。ケーブル13はハンガー部9チューブ固定部12の中を保護されコネクタ14に接続される。内耳イヤホン1が装着されているイヤモールド10には、本体側のコネクタ14に対するコネクタ15を有し本体側からの電気信号を受け、内耳イヤホン1へと伝達する。ここで内耳イヤホン1の振動を伝えた内耳イヤホン1、イヤモールド部10、コネクタ15から形成されるイヤモールドシェル部を用意しておけば容易に特性の違う補聴器を製作できる利点を有する。

また第2図は他の実施例の構成を示すものであり、この実施例では第1図で14，15のコネクタをなくし伝送ケーブル13をイヤモールド10に固定し本体からのケーブル13を直接内耳イヤホン1に接続している。したがってこの実施例ではイヤホンの交換はできないが、イヤホンを外耳道内に置くことによる周波数特性の平坦化を行うことができる。

発明の効果

本発明は上記実施例より明らかなように従来耳かけ形の補聴器本体に内蔵されている内耳イヤホンを本体から取出しイヤモールドシェルに組込んだものであり、従来耳かけ形の周波数特性に比べ平坦な周波数特性を得ることができるという効果を有する。

またイヤホンを組込んだイヤモールドシェルを取換えることにより、使用者の色々な特性に合わせた補聴器の特性を選択することが可能である。

また使用者の耳型に合わせたイヤモールドシェルを十台にふさく作ることにより外観上補聴器を使用していることが目立ちにくく使用者の心理的な抵抗を解消することが可能であり、音のフィードバック（ハウリング）の点でも大幅な改善を得ることができる効果を有する。

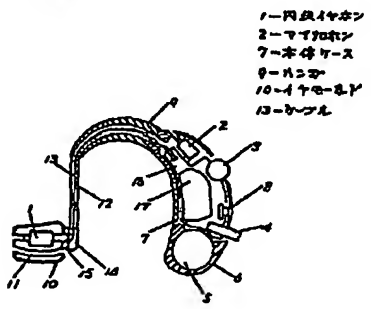
4. 図面の簡単な説明

第1図は本発明の一実施例における補聴器の構成図、第2図は他の実施例を示す要部構成図、第3図は従来の補聴器を示す構成図、第4図、第5図は従来の部分詳図、第6図は従来の補聴器の周波数特性図、第7図は従来例における改善された周波数特性図である。

1…内耳イヤホン、2…マイクロホン、3…音響振動ダイヤフラム、4…切換スイッチ、5…電池、6…電池ケース、7…本体ケース、8…調整用トリマ、9…ハンガ、10…イヤモールド、11…ベント、12…ケーブル固定、13…ケーブル、14…コネクタ、15…コネクタ、16…プリント基板、17…電子回路部。

代理人の氏名 弁理士 中 尾 敏 男 ほか1名

第1図



第2図